$+\sqrt{\frac{x^2}{4}-40x+2000}$, is to be a minimum. $\frac{du}{dx}=\frac{x}{\sqrt{(x^2+144)}}+\frac{\frac{x}{4}-20}{\sqrt{\frac{x^2}{4}(40x+2000)}}$.

Making this equal to zero and reducing, we get $3x^4-480x^3+25456x^2+23040-921600=0$. By Horner's Method I find $x=5.88$ ft., nearly, $=AF$, $EF=13.36316$=distance down wall, $FC=84.22454$ ft.=distance on floor.

$\therefore$ Time$=13.36316+84.2254\div2=55.47543$ seconds, *Ans.*

II Solution by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy in New Windsor College, New Windsor, Maryland.

The spider may take several routes; but the one requiring the *minimum* of time necessitates a perpendicular descent of 12 feet on the wall and a diagonal crossing of $\sqrt{[(80)^2+(40)^2]}=89.44+$feet on the floor, and the time required is 56.72 seconds.

III. Solution by J. K ELLWOOD, A. M., Principal of Colfax School, Pittsburg, Pennsylvania; W. L. HARVEY, Portland, Maine; P. S. BERG. Apple Creek. Ohio; COOPER D. SCHMITT, Professor of Mathematics, University of Tennessee, Knoxville, Tennessee: and LINNAEUS HINES, Teacher in High School, Evansville, Indiana.

The entire distance the spider crawls is the hypotenuse of a rt. triangle whose base is 80 ft. and whose perpendicular is 40+12, or 52 ft., which is $\sqrt{80^2+52^2}$, or 95.41+ft.

The height: the width :: 3:10 :: distance crawled on wall : distance on floor. Hence $\frac{3}{13}$ of 95.41+ft., or 22.01 ft. is the distance crawled on wall; and $\frac{10}{13}$ of 95.41+ft., or 73.39ft. is distance crawled on floor.

$\therefore$ $22.01\div1+73.39\div2=58.71+$seconds the time required.

This Problem was also solved by Professor *G. B. M. ZERR, FRANK HORN, M. A. GRUBER,* and *J H. DRUMMOND.*

24. Proposed by Mrs. MARY E. HOGSETT, Danville, Kentucky.

On Jannary 4. 1889, it was noticed that a clock was 15 minutes fast. On March 1, 1894, it was found to be six and one half minutes slow. When and what time was accurate time?

Solution by FRANK HORN, Meadville, Missouri.

II.
1. 1882 days=time from January 4, 1889 to March 1, 1894.
2. 15 minutes+$6\frac{1}{2}$ minutes=time the clock lost in 1882 days.
3. $\frac{1882}{21\frac{1}{2}}$ days=time required for the clock to lose 1 minute.
4. $1313\frac{1}{43}$ days=time required for the clock to lose 15 minutes.
5. January 4, 1889+$1313\frac{1}{43}$ days=33 minutes $29\frac{1}{4}\frac{7}{3}$ seconds past 12 o'clock, A.M., August 11, 1892.

III. $\therefore$ The clock indicated true time, 33 minutes $29\frac{1}{4}\frac{7}{3}$ seconds past 12 o'clock A. M., provided the observation was made at midnight, January 4, 1889.

This problem was also solved by *J. K. ELLWOOD, H. C. WHITAKER, COOPER D. SCHMITT, G. B. M. ZERR, F. P. MATZ,* and *P. S. BERG.*